The Sea Grant Approach to Coastal and Marine Research, Extension, and Education

A Review of International Experience and Opportunities

Background Paper No. 1

Sea Grant International: Latin America and Caribbean Initiative

Final Draft

May 24, 2004

Prepared by the NOAA/OAR International Activities Office, University of Rhode Island Coastal Resources Center and the University of Rhode Island Sea Grant College Program

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ACKNOWLEDGMENTS

This study was made possible through the support provided by the U.S. State Department's Ocean, Environment and Science Initiative, and the NOAA National Sea Grant Office. The principal authors are James Tobey, University of Rhode Island Coastal Resources Center, and Matt Wilburn and Jill Hepp, NOAA/OAR Office of International Activities. We wish to express our appreciation to the many professionals from U.S. Sea Grant College Programs, universities, government agencies, non-governmental organizations, and international development organizations who offered their insights and experience with Sea Grant programs and other similar programs involving linked education, research and extension.

ACRONYMS

ASGEPL	Assembly of Sea Grant Extension Program Leaders
CCOP	Coordinating Committee for Coastal and Offshore Geosciences Programs in East and Southeast Asia
CGIAR	Consultative Group on International Agricultural Research
ICLARM	International Center for Living Aquatic Resources Management
UHSGCP	University of Hawaii Sea Grant College program
KSGP	Korea Sea Grant Program
MMAF	Indonesian Ministry of Marine Affairs and Fisheries
MOMAF	South Korea the Ministry of Marine Affairs and Fisheries
NOAA	National Oceanic and Atmospheric Administration, U.S. Department of Commerce
NOAA/OAR	NOAA Office of Oceanic and Atmospheric Research
NSGCP	National Sea Grant College Program
NSGO	NSGO
NSGRP	National Sea Grant Review Panel
OTIA	Office of Territorial and International Affairs, U.S. Department of Interior
PAP	Sea Grant Pacific Aquaculture Program
PIN	Sea Grant Pacific Island Network
PMC	Program Mission Committee
SGA	Sea Grant Association
SGIP	Sea Grant International Program
UCA	University of Central America, Nicaragua
UHSGCP	University of Hawaii Sea Grant College Program
UNAM	Universidad Nacional Autónoma de Mexico
USAID	United States Agency for International Development

1. INTRODUCTION

This paper describes the defining features of the U.S. Sea Grant College Program, summarizes the experience of Sea Grant with international partnerships, reviews applications of Sea Grant type programs in other countries, and explores other similar program experience with linked education, research and extension. This paper is part of a NOAA initiative to identify strategies for adapting the Sea Grant model to selected developing nations and to create a global network of institutions dedicated to discovering and applying the knowledge, values and technologies needed for more sustainable forms of coastal development and conservation.

The initiative is called the "Sea Grant Latin America and Caribbean Program" and is conducted under the guidance of the NOAA/OAR International Activities Office, University of Rhode Island Coastal Resources Center, and University of Rhode Island Sea Grant program. This initiative is a response to requests from government and university officials in Honduras, Nicaragua, El Salvador and Ecuador to build Sea Grant programs in these countries. The funding for this initiative comes from the U.S. Department of State (Ocean, Environment and Science Initiative), NOAA Research International and the NOAA National Sea Grant Office.

This is one of two background papers, that together with a series of national workshops and expert meetings, are the basis for the development of a strategy for the implementation of a Sea Grant network in Latin America and the Caribbean.

2. THE SEA GRANT COLLEGE PROGRAM

The National Sea Grant College Program (NSGCP) was first proposed in 1963 as a means to "promote the relationship between academic, state, federal, and industrial institutions in fisheries"(Miloy, 1983) and three years later this idea was formalized by the National Sea Grant College and Program Act. Sea Grant's legislative charge is to "increase the understanding, assessment, development, utilization, and conservation of the nation's ocean and coastal resources by providing assistance to promote a strong education base, responsive research and training activities, and broad and prompt dissemination of knowledge and techniques" (PL94-461, Sec. 202(b)).

> *"When the 89th congress passed the National Sea Grant College and Program Act of 1966, it created the first federal program mandated to support activity across the full spectrum of the marine sciences. In the act, Congress set forth an approach involving research, education and outreach to promote the wise use of the nation's coastal, ocean, and Great Lakes resources for a sustainable economy and environment" (NSGO 1998).*

The Sea Grant Program operates on a simple premise—apply the intellect of US universities and research institutions to the problems and opportunities associated with the use of marine resources. The Sea Grant Act called for an organization that is science-based, national in scope and committed to the transfer of scientific information to the public. In 1971 four universities achieved Sea Grant College status: Oregon State University, University of Rhode Island, Texas A&M University and University of Washington. Today, the Sea Grant network has approved programs in 30 universities with over 300 affiliated universities and several thousand researchers, educators, extension professionals and students.

Sea Grant is a partnership of academia, government, and industry focusing on coastal and marine resources. It operates through a university-based network to meet environmental and economic needs. This partnership has created a national network of researchers and educators focused on promoting better understanding and more informed use of coastal and marine resources.

The basic structure of a federal-state funding partnership is itself based on the time-tested paradigm of Land Grant Colleges—

University-based research coupled with the transfer of science-based knowledge to communities and users through extension service. Establishing a formal structure to link and integrate university educators and scientists to extension agents provides a powerful means to transfer knowledge to advance wise coastal and marine development while promoting resource stewardship.

A Top-Down and Bottom-Up Network for Collaborative Problem Solving

The NSGCP was originally structured as a component of the National Science Foundation but in 1970 the program became part of the Department of Commerce, National Oceanic and Atmospheric Administration (NOAA). The NSGO provides base funding for Sea Grant and coordinates activities for the network of 30 state programs (see list of Sea Grant State College Programs, Annex 1). The national office in NOAA provides administrative and programmatic support in the form of developing national program initiatives, federal budget requests, program monitoring and evaluation, and communicating program activities to other NOAA and federal offices. The current administrative team of the national office consists of the Director, Executive Director with five associated staff, a Research Director with six associated staff, and the Outreach Director with four associated staff members.

The Sea Grant program identifies topics of concern to the nation as a whole. State programs then tailor activities within the broad topics of concern that resonate in a given locale. Thus, the strategy of Sea Grant is to combine national-level and state-level priorities with the flexibility to adapt and respond to emerging, local resource needs. This strategic process between national and state levels builds knowledge for use by the network as a whole.

The Sea Grant structure was designed to allow for significant autonomy at the state level. This autonomy has resulted in a diversity of organizational schemes, but some generalizations can be made. Most programs operate through a single university; a few programs are structured as university consortiums (Mississippi-Alabama Sea Grant Consortium and the South Carolina Sea Grant Consortium). Each program maintains an administrative office, which manages the research, extension, and communication activities and distributes funds on an annual or biannual basis to a wide range of institutions (i.e. not limited to only researchers at the host university) via a competitive grants process. Programs leverage state university resources as matching funds to those disbursed by the NSGO.

A collection of national associations, panels, assemblies, boards and committees has developed over the course of the program's history. Several of these are a formal part of the legislation and others have developed on an ad hoc basis as necessary. The National Sea Grant Review Panel (NSGRP) is part of the original legislative structure of the Sea Grant program. The 15 appointed members of the panel set overall program policy, establish direction and conduct reviews of the National Sea Grant program.

The Sea Grant Association (SGA) is a non-profit organization comprised of a representative from each Sea Grant institution. SGA provides the mechanism for state and national programs to coordinate their activities, to set priorities at both the regional and national level, and to provide a unified voice for these institutions on issues of importance to oceans and coasts. The SGA has a number of standing committees including the Program Mission Committee; External Relations Committee; and Finance Committee. The Program Mission Committee is charged with strategic planning and preparation of policies and procedures to accomplish the Sea Grant mission. Sea Grant identifies national priorities by regularly sorting through the network's priorities, accomplishments, and best practices.

Sea Grant activities exist at the nexus of local, state, national and sometimes international interests. In this way, local needs receive national attention, and a national commitment is fulfilled at the local level.

The focus of individual Sea Grant College Programs must be both consistent with the overall vision and direction of the NOAA National Sea Grant Program, and be tuned to the environmental, social and economic priorities and problems at the state level. State programs are designed to respond in a timely-fashion to locally identified education, research and extension needs. This top-down and bottom-up approach, built into the organizational and governance structure of Sea Grant, provides the inherent flexibility to ensure that both focused long-term strategies for impacting national-level marine and coastal priority issues are addressed, while at the same time allowing each program the ability to tackle important local issues.

Most state programs have Advisory Boards or Councils, which provide programmatic direction. They are composed of a wide variety of stakeholders and play a pivotal role in identifying priority coastal and marine issues and actions that the Sea Grant programs can take to address those issues.

Cross cutting "theme teams" have been formed to coordinate activities on selected issues of national importance and disseminate information. The system of theme teams pulls together the intellectual and pragmatic resources from throughout the national network, develops products, catalyzes sharing of information and ideas, and acts as a well-informed voice for responsible stewardship of coastal ecosystems in specific topics of concern.

Example of State Sea Grant Advisory Council

The Louisiana Sea Grant Advisory Council meets twice annually to review selected Sea Grant activities and provide counsel regarding program focus, development, and operations. This Advisory Council has eighteen members representing a diversity of stakeholders ranging from the Louisiana departments of Natural Resources, Environmental Quality, Wildlife and Fisheries, and Recreation and Tourism. There are also representatives from the private sector such as Tidewater, Inc., the Slater-Midboe Law Group, Nunez Insurance Agency, and the Consortium for Plant Biotechnology to name just a few.

Thematic areas are defined by the SGA, but ideas for themes can be brought forth to the SGA's Program Mission Committee by anyone within the Sea Grant network. Currently, theme team topics are 1) aquaculture, 2) biotechnology, 3) coastal communities and economies, 4) natural hazards, 5) ecosystems and habitats, 6) marine and aquatic science literacy, 7) fisheries, 8) digital ocean, 9) urban coast, and 10) seafood science and technology.

The Assembly of Sea Grant Extension Program Leaders (ASGEPL) facilitates communication and interaction among the Sea Grant Extension programs and with others outside the Sea Grant network. This Assembly improves the delivery of science-based information to constituent groups at the local, regional and national levels. The ASGEPL is comprised of an extension representative from each state Sea Grant program. Similar organizations exist for Sea Grant Communicators, Educators, and Fiscal Officers. Regional efforts to coordinate research and extension work are also supported through the existence of five regional groups of state programs: the Great Lakes, Northeast, Mid-Atlantic, Southeast Atlantic/Gulf of Mexico and Pacific.

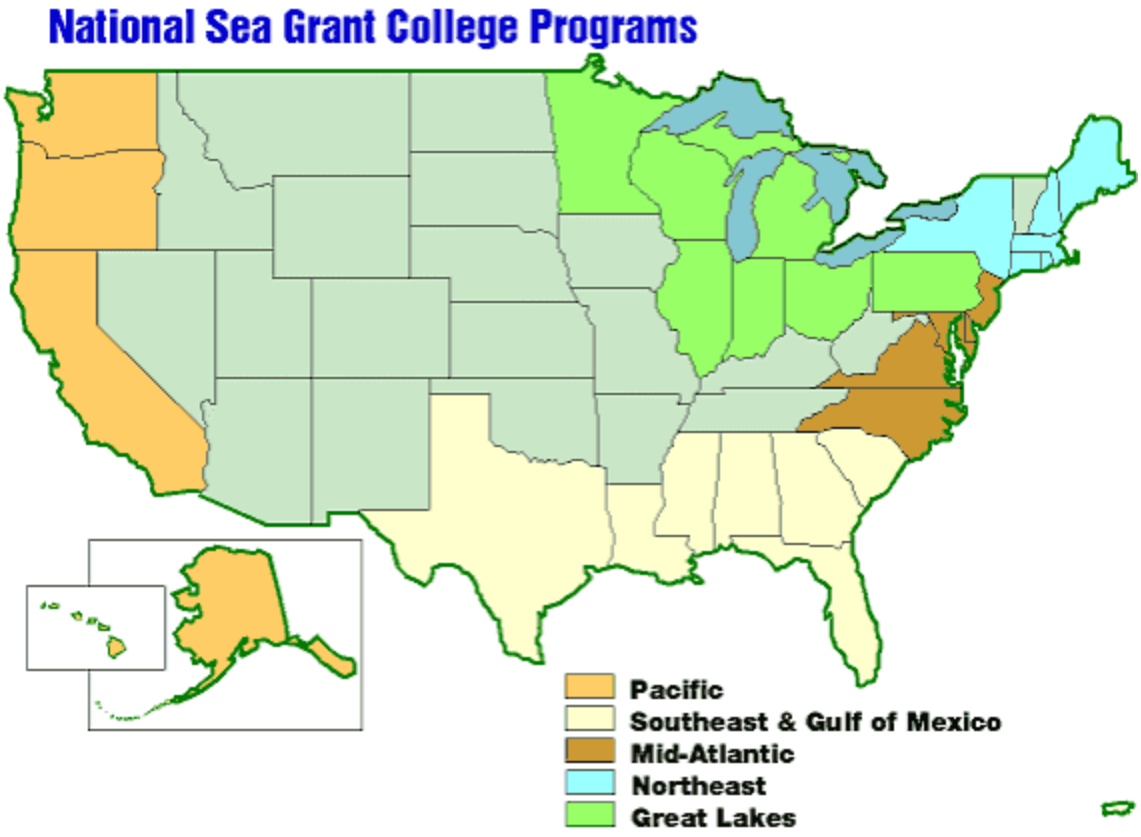
Stages of Program Development

All programs have achieved their designation as a Sea Grant College Program by moving through a series of four development steps: 1) Project Grant, 2) Coherent Area Program, 3) Institutional Program, and 4) Sea Grant College. Programs progress by demonstrating success, developing the necessary organizational capacity and working with the NSGO to ensure transparency and accountability in their activities. The four-tiered process of development allows programs to develop state and local partnerships, gradually define the scope of their work, and gain familiarity with the Sea Grant operational structure and system.

In the first step, an institution applies to the National Sea Grant Office (NSGO) for a Project Grant that is in the form of a proposal to initiate a Sea Grant programmatic activity for a given time period. After the institution has demonstrated capacity and competence in program activities it is eligible to apply to the NSGO to become a Coherent Area Program, which allows the institution to conduct Sea Grant activities in a limited geographic area or field. Federal grants can be made to Coherent Area Programs on a continuing basis if the quality and relevance of the program is maintained. After an institution has shown competence as a Coherent Area Program they may apply to the NSGO to gain status as an Institutional Program.

The fourth and final step in program development occurs when an Institutional Program applies for status as a Sea Grant College. This designation is made by the U.S. Secretary of Commerce. The institution then has the broad responsibility for administering a state Sea Grant program and the mandate to engage all of the institutions of higher learning in the state.

In some cases special programs have been developed to address shared regional issues. The most recent of these, the Lake Champlain Sea Grant Outreach Program, is a joint effort of the New York and Vermont Sea Grant programs. The purpose of the Lake Champlain Sea Grant Program is to provide scientific information to serve as the basis for wise development and conservation of the Lake Champlain ecosystem.



Funding and Competitive Grant Procedures

The National Sea Grant Office managed funds totaling $112.3 million in 2001 with approximately 55% of the funds from federal appropriations and matching funds from state partners accounting for about 33% of the total. Since 1997, federal funding for state programs has been based on a combination of base funding, merit funds, program development awards, pass-through funding, national infrastructure support grants (rapid response grants) and unobligated funds. In Fiscal Year 2001, the breakdown for the use of federal Sea Grant funds was Research (66.3%), Outreach (29.7%), Education (4.8%) and Administration (8.7%) (NSGO 2002).

A minimum Federal investment to operate an effective Sea Grant Program has been determined to be approximately $1.8 million ($1.2 million Federal funding and $0.6 State funding). This allows for approximately 9 modest sized research projects per year, 4-5 extension specialists and a budget for management, education and communications. Some programs have yet to reach the minimum $1.2 federal base funding level and therefore are eligible to receive "base-minimum adjustments" when the funds are available from the NSGO. These supplementary funds are awarded based on merit grades from performance evaluations. (Sea Grant Association, 2002)

State Sea Grant programs are expected to provide a 2:1 match for federal funds but many programs actually leverage at a higher rate.

> *"This highly leveraged investment in Sea Grant is crucial to ensure appropriate federal, state, local, university, and private-sector efforts to support and enhance our burgeoning coastal economy while conserving and protecting the natural resource base upon which it depends." (SGA Position Statement 2/5/02).*

Most programs operate on a biennial research schedule with approved projects on a two-year time frame. Requests for Proposals (RFP) are disseminated widely and proposals are accepted from a variety of institutions, not limited solely to researchers from the host university. For example, the Connecticut Sea Grant program in the 2000-2001 funding cycle awarded grants not only to the University of Connecticut (the Sea Grant host university) but also to the Maritime Aquarium, Wesleyan University and Yale.

All Sea Grant related activities of applied research, extension and education are subject to a rigorous scientific peer-review process (similar to the review process of the National Science Foundation). Each state Sea Grant program solicits pre-proposals and full proposals for research within its geographic boundaries in interest areas guided by a five-year Strategic Plan and a two-year Implementation Plan. Short pre-proposals are solicited first by the state Sea Grant program. Pre-proposals are then reviewed extensively by national experts located outside of the state. This panel balances the strategic Plan of the Sea Grant program with the research ideas proposed, and makes recommendations on which pre-proposals should be invited to prepare and submit full proposals.

After full proposals are received, they are reviewed by three to five experts outside the local program selected by the state Sea Grant program. Each state program's management team then convenes a Technical Review Panel selected from national experts outside of its geographic boundaries to discuss review findings, deliberate on each proposal, rank proposals, and decide on funding for selected proposals. Research and extension proposals approved at the state-level are then sent to the National Sea Grant Office for final approval.

Sea Grant program performance evaluations are conducted every 4 years by senior internal and external evaluators to determine impacts and quality standards.

Research, Education, and Extension Linkages

Sea Grant is different from most other US federal programs because of its three-pronged approach of applied research, education and extension (there are exceptions, e.g. systems of education, experimentation, and cooperative extension of the U.S. Department of Agriculture). The linkage between applied research, extension and education is a fundamental attribute of the Sea Grant Program. It ensures that the results of research are disseminated back to the stakeholders in a timely manner and conversely ensures that social and natural scientists are kept abreast of evolving coastal and marine resource issues.

The communications team at each Sea Grant Program provides the means to disseminate information from research and extension projects in a timely and effective manner through a variety of outlets: press releases, bulletins, reports, newsletters, radio and television programs and websites.

The Sea Grant Extension component is typically a university-based educational program that applies knowledge and understanding gained through research to aid individuals and groups. The goal of extension is to effect change by having individuals, groups or institutions use science-based information.

Much of Sea Grant's strength lies with its local, grass roots approach. Overlaid on this local approach is a strong regional and national network. The experience and lessons from extension work in one community can, for example, be easily shared and modified for use in another community on the other side of the continent.

Some programs have a specific requirement in their research RFP's that require the Principle Investigator to integrate some type of extension into proposed project activities. Other programs ensure this link between extension and research by assigning an extension agent to research grants to assist with design and implementation of extension activities. In some cases, Sea Grant programs subcontract the extension component to a partner university or state agency.

Approximately two-thirds of the Sea Grant Extension service have formal affiliations with the State Cooperative Extension Service (CES). Partnering with CES builds a broader fiscal and human resource base for Sea Grant Programs.

Strengths and Reasons for Success

The National Sea Grant College Program has evolved over the past 35 years into a functional network of programs providing science-based answers to coastal and marine problems. Sea Grant programs have promoted sustainable economic development, created new technologies, products and services, enhanced coastal and marine resource management, reduced the loss of life and property, and educated tens of thousands of students. Some of the key characteristics that are the reasons for Sea Grant's success include:

Addressing the Urgent Needs of Society. Sea Grant is a strategic program, developing medium and long-term goals and priorities for research, education and extension in close collaboration with coastal stakeholders. In this way, resources are channeled to the most pressing social, economic, and environmental issues.

Continuity and Long Term Investments. Once a university has met Sea Grant selection standards and has been formally designated as a member of the network, there is a federal commitment to sustain financial support over the long-term. Long-term commitment builds a community of coastal managers, policy experts, educators, researchers and private sector partners dedicated to resolving the issues of coastal and marine development and conservation. This permanence is also what makes long term strategic planning possible.

Trust. Continuity and local partnerships also build trust with stakeholder groups and a supportive constituency that are critical for success of extension work. Sea Grant as an institution has a reputation of being a committed and dynamic group of researchers, educators, communicators and extension agents that produce respected and practical scientific knowledge for society. Sea Grant also adopts a non-advocacy role and is viewed as an impartial and objective broker of information.

Catalyzing Existing Institutional Capacities. Sea Grant serves as the catalyst for bringing intellectual and physical resources to bear on the needs and opportunities of communities. Rather than create new institutions, Sea Grant mobilizes and sustains long-term connections with existing institutions to tackle coastal and marine challenges. Utilization of largely existing people and facilities minimizes duplication of effort, leverages resources, and creates assets of considerable pragmatic value at a comparatively low cost to the taxpayer. Maintaining institutional connectivity is important and having an institutional coordinating point (Sea Grant) assists in accomplishing this task.

Striving for Excellence and Accountability. Sea Grant programs operate under a formal system of checks and balances with rules that allocate responsibility among a central office, participating universities, and individual researchers and extension agents. The system relies on strategic planning, competition, and a rigorous peer review process. Funding is reduced or withdrawn from programs and individuals that do not meet standards of professional excellence in management, education, research and extension. A defining feature of Sea Grant is that excellence is judged primarily against the relevance of the activity to priority coastal and marine issues.

Local Ownership. Sea Grant is designed as a decentralized system that responds to the priority issues posed by coastal conservation and development in a given place. Strategic plans, implementation plans, annual reporting, and external program assessments involving all coastal stakeholders are required of each local program. While the network as a whole identifies common topics of concern, the formulation of the agenda of an individual participating institution, and the process for designing and selecting those who will participate in a given program, resides primarily with that institution. Thus, the ownership of each program is local.

A Nested System. The Sea Grant network as it exists today in the United States functions as a nested national system that operates to address ten priority "themes". Thematic focus areas gather the intellectual resources from throughout the national network, sharing information and ideas, and acting as a well-informed voice for responsible stewardship of coastal ecosystems at the local state and national scale.

3. THE BENEFITS OF AN INTERNATIONAL SEA GRANT NETWORK

Most coastal regions of tropical developing nations are characterized by high and growing population density, increasing human pressures on natural resources and ecosystems, resource use conflicts, and growing vulnerability to natural disasters. The proportion of the global population that is defined as coastal is now about 50%, and it is increasing. Of the world's 15 largest cities, all but two are located on a coast. In Latin America, nearly 70 percent of the region's population now lives in cities, and 60 of the region's largest 77 cities are coastal (Hinrichsen, 1998). Such population and associated economic growth have produced large environmental impacts on the marine and adjacent land ecosystems.

As stewards of the Earth's coastal zone, our own efforts are undermined with widespread habitat loss, pollution of coastal marine ecosystems, over-harvesting and destructive fishing. One-third of the world's coastlines face serious environmental degradation. Half of the world's wetlands were destroyed in the 20th century, and nearly 60 percent of the earth's coral reefs are now threatened by pollution and other

dangers. The global oceanic fishing fleet is today 40 percent larger than what the oceans can sustain. As testimony to this fact, 35 percent of 200 major fish stocks are currently classified as overfished or at their biological limit (Costanza, et al., 2000). These fish stocks currently account for 77 percent of world marine landings.

The underlying sources of coastal and marine environmental degradation are deep rooted. All developing countries are confronted with well known, acute socio-economic problems related to poverty and poor governance. Governments are poorly funded and often overwhelmed with the burden of poverty alleviation and maintaining basic infrastructure. Conservation efforts often fail owing to lack of financial, political and sometimes popular support.

Nevertheless, economic development must be built on a foundation of sustainable resource use and environmental protection. In the Latin America and Caribbean region many of the economic opportunities depend on its natural resource base, including tourism, fisheries, aquaculture, agriculture, and forestry products. Improving the management and conservation of critical watersheds and coastal habitats provides a mechanism to integrate natural resource conservation with the development of sustainable economic opportunities.

As governments, communities and society explore ways to solve worsening problems of loss of the natural stock of living marine resources, inappropriate coastal development, invasive species and pollution, many have looked to the example of the National Sea Grant College Program as a way forward. The benefits of an international Sea Grant network include:

Benefits to Sea Grant and Foreign Partners. Expanding the domestic Sea Grant network to a global system with associated international partnerships and collaboration will energize the Sea Grant Program and create two-way benefits. One of the benefits would be learning, knowledge and hands-on experience in how to tackle problems of habitat destruction, overfishing, coral reef conservation, coastal erosion, mitigation of coastal hazards and resolving conflicts between competing user groups. These are global priority issues along all coastlines.

For participating U.S. Sea Grant programs, an international dimension will provide "platforms" where research, curricula and the development of best management practices can be adapted to new social and environmental contexts. Established international programs would provide in-country facilities and logistical support for visiting research scientists and student research teams. In-country program contacts can also help to expedite scientific research permitting process that often can be confusing and time consuming for foreign investigators.

Benefits to Other Organizations and Initiatives. Major investments have been made in coastal and marine conservation and sustainable use but communication and knowledge sharing has been *ad hoc* and inefficient. Too often coastal management efforts have been conducted in isolation from other efforts. The result is a smaller cumulative impact of the total investment in resource management.

Sea Grant can provide a mechanism to re-integrate the many approaches to coastal and marine science and extension. In the U.S., Sea Grant programs provide a clearinghouse for information, contacts and work on coastal and marine development and conservation. By contrast, in most developing nations, institutions with continuity and publicly accessible resources on coastal issues of societal concern are usually absent. As a consequence, there is a constant reinventing of the wheel as new projects come and go. Sea Grant programs would help fill this void, thereby increasing the effectiveness and efficiency of otherwise isolated coastal and marine initiatives. The Sea Grant structure could also act as a central coordinating forum, collectively setting strategic priorities in coastal research and extension with stakeholder groups and increasing the cumulative benefits of the work of existing organizations.

A global Sea Grant network would compliment and provide new opportunities for many United States Government programs such as the GLOBE program, the Fulbright Senior Specialist Fellowship program and projects funded under many other federal agencies such as those of the USDA Cooperative State Research Extension and Education Service (CSREES) and USAID. GLOBE is a worldwide hands-on, primary and secondary school-based education and science program. The traditional Fulbright Fellowship program allows graduate students from the United States to research or study in foreign countries while the Senior Specialist Fulbright provides opportunities for career professionals to take part in short-term (3-6 weeks) assignments that have been specifically requested by a foreign institution.

Sea Grant institutions established in coastal nations around the world would also provide benefits for other bilateral and multilateral programs (e.g. United Nations, World Bank, Inter-American Development Bank, etc.) and would add a new element of support for implementation of international and regional commitments.

Unique benefits that Sea Grant programs can provide include scientific knowledge, strengthening of local institutions, consultative identification of local issues and needs, local ownership of strategic priorities, trust, convening power, and supportive constituencies.

White Water to Blue Water Initiative

A "White Water to Blue Water" initiative for the Wider Caribbean Region was announced by the U.S. State Department at the World Summit on Sustainable Development in Johannesburg, South Africa in September 2002. The Wider Caribbean Region encompasses twenty-six countries and island states.

The goal is to strengthen both national and regional institutional capacity to implement cross-sectoral watershed and marine ecosystem management. The White Water to Blue Water initiative is intended to identify ways to improve implementation of regional and international commitments and to increase partnerships and the cumulative impacts of efforts in coastal and marine sustainable development.

Steering Committee deliberations have clearly highlighted the need for national institutions in the Wider Caribbean with the characteristics and strengths of the Sea Grant model. Like the U.S. Sea Grant program, common priority themes and theme teams have been developed.

National Benefits. Sea Grant programs would contribute to the management of coastal and marine resources in an integrative manner that combines conservation with the creation of economic opportunities. Sea Grant programs build the long-term capacity base needed within an institution to address the development and conservation needs of the coastal zone by supporting research, developing marine and coastal curriculums and supporting the interests of undergraduate and graduate level students. The characteristics of Sea Grant that make it effective in the United States would also apply to other countries—especially institutional capacity building, flexibility to meet local needs, transparency, strategic planning, science linked with extension, and partnerships that increase local capacity to manage resources. Knowledge is vital in the conservation efforts now unfolding to preserve marine ecosystems. Extension of knowledge to users is an area of particular need in most developing nations. Most low-income countries have not been successful in dedicating the resources to a strong, public-sector extension program with links to educational institutions.

In the United States, Sea Grant has been an engine for economic growth and cost savings through the development of new products, innovations, and technologies in aquaculture, marine biotechnology, fisheries, seafood processing, and the marina and boating industry. Research and extension to reduce the risks of natural disasters in coastal regions have saved lives and saved society hundreds of millions of dollars in avoided property damages. Education efforts have greatly enhanced the general public's awareness of the marine sciences and knowledge about the coastal and marine environment. Successful Sea Grant programs in other countries would bring similar social, educational and economic benefits.

Regional Benefits. Regional and global networks of programs modeled after Sea Grant would provide a much-needed forum to share resources, knowledge and experience, organize initiatives, leverage resources and provide a focal point for information management. This would in turn allow for more effective and efficient resolution of shared marine and coastal resource management issues. The network structure of the NSGCP provides what has proven with experience to be an effective approach for promoting regional cooperation, technology transfer and capacity building. It facilitates functioning connections between programs allowing different regions to share ideas, exchange technical expertise, promote cooperation, and prioritize thematic areas of focus.

A problem that has not yet been solved in the management of living marine resources is one of over exploitation of important pelagic coastal resources simultaneously in two or three countries. For example, Ecuador and Peru fish the same fishery stocks but do not share common management policies that promote the objectives of sustainable exploitation. Similarly, Honduras, El Salvador and Nicaragua share the resources of the Gulf of Fonseca, but each country has its own fishery, conservation and management schemes. National Sea Grant institutions functioning in areas where several countries share coastal and marine resources would provide a mechanism for promoting harmonization of coastal and marine conservation efforts. Greater coordination and harmonization of independent management approaches would reduce costs and improve effectiveness. An impartial interaction between universities can also help transcend long standing political impasses between countries that share marine resources.

4. PAST EXPERIENCE WITH SEA GRANT OVERSEAS

The Sea Grant program has a long history of international cooperation and assistance. From the inception of the idea in the mid-1960's to the present, there have been varying levels of commitment to international collaborative activities and programs. Initiation of the Law of the Sea Convention in the early 1970's provoked concerns regarding international research access and data rights. This provided the impetus for the Sea Grant program in 1976 to adopt legislation for an international component to its mandate—the Technical Cooperation Assistance Program (under Section 3 of the Sea Grant Program Act of 1976). This program was redefined by Congress two years later as the Sea Grant International Program (SGIP). The goals of the Sea Grant International Program were to:

- Enhance cooperative international research and educational activities with universities on ocean and coastal resources
- Encourage technology transfer that enhances wise use of ocean and coastal resources in other countries
- Promote the international exchange of information and data on the assessment, development, utilization and conservation of ocean and coastal resources
- Support other U.S. international initiatives whose purposes are related to research, education, technology transfer and public service concerning the understanding and wise use of ocean and coastal resources

SGIP projects facilitated educational, research and technical exchanges with universities and marine research institutions in other countries. The International Program was federally funded from 1978 to 1983 and involved 12 projects in 19 countries with a total budget of $3 million. Projects primarily focused on education, research or technical partnerships rather than on capacity development of partner universities to establish their own Sea Grant type programs.

Federal funding for SGIP was discontinued in 1983. However, the Sea Grant International Program was not removed from federal legislation until the Marine Resources Revitalization Act of 1997 repealed

Section 3 of the Sea Grant Program Act of 1976. From 1983 onwards, limited international research and collaboration have continued through a number of decentralized state programs without the funding support of the National Sea Grant office. There have also been a number of Sea Grant program and other U.S. federal agency partnerships with governments and universities in other countries, such as Korea, Indonesia, Nicaragua, and Honduras, with the purpose of long term institutional capacity development for Sea Grant type research, education and extension.

The Sea Grant International Program (1978-1983)

This section provides a summary of Sea Grant International Program projects that were funded by the federal government until 1983. (Ebitz and Murray, 1984) A characteristic of most of the projects funded under SGIP was complementary partner support, often equivalent in value to the SGIP budget. Partner organizations contributed in the form of salary support, local travel, housing, field logistics, publication of conference proceedings and research, use of research vessels, freight charges, use of offices, and computer time. Thus, although the SGIP operated with a total budget of only $3 million, the impact was much greater.

1. ***University of Hawaii Sea Grant International Cooperative Program in the Pacific.*** From 1979-1982 the University of Hawaii Sea Grant College Program (UHSGCP) partnered with the University of the South Pacific and the University of Guam to bring the benefits of Sea Grant led marine education, research, and extension to Pacific island groups in Micronesia and Polynesia. This program focused on "training of islanders." A number of these trainees are still active leaders in marine enterprise and affairs of the south Pacific Islands. Guam received both research and extension funding. Extension agents were also supported through SGIF in American Samoa and the Commonwealth of the Northern Marianas. The initiative was funded with a $288,500 grant from the SGIP.

2. ***University of Miami Training and Information Exchange with Colombia.*** The University of Miami worked with several Colombian partners in a three-year, $311,400 project. Partners included the Colombian Oceanographic Commission, the Institute for the Development of Renewable Natural Resources, the Hydrographic and Oceanographic Research Center, the University of Bogota, the University of Cartagena, the University of the Andes, and the National University of Colombia. The objective was to enhance the capability of Colombian scientist to provide useful scientific information for the development of management plans for coastal and marine resource management. Activities involved a series of lectures on integrated marine and environmental research of Cartagena bay and job training in the design, planning, execution and coordination of field and laboratory programs.

3. ***Maryland Sea Grant Partnership with the Department of Microbiology, Institute of Public Health, Egypt.*** A two-year project between the Maryland Sea Grant Program and the Egyptian High Institute of Public Health was initiated in 1979 with a SGIP budget of $134,400. The objective was to enhance Egyptian capabilities in marine environmental microbiology. Activities included workshops, student training, application of field techniques, and an annual seminar on environmental microbiology in tropical waters.

4. ***LSU Sea Grant Partnership with the National University of Mexico.*** A four year project between the Center for Marine Science at Louisiana State University and Universidad Nacional Autónoma de Mexico (UNAM) had the goal of improving Mexican capabilities for ecosystem analysis and coastal management. The project was funded with a $111,200 SGIP grant and included support for participation in scientific meetings and conferences, information exchange, graduate student training, and joint research and publication. The project involved a cooperative study of

management topics associated with the shrimp fishery of Laguna de Terminos and the development of a hydrodynamic model. An evaluation of the project found that the project significantly enhanced marine science capability at UNAM and scientific collaboration exchange between the two partners.

5. ***University of Delaware Partnership with the University of Costa Rica.*** The University of Delaware's College of Marine Studies (CMS) worked with the University of Costa Rica (UCR) from 1979 to 1983 with a SGIP grant of $623,500. The project had several components including training, technology exchange, equipment and vessel exchange, and research. The University of Delaware stationed a scientific research vessel in the Gulf of Nicoya for four years with both research and crew staff from the University of Delaware and the University of Costa Rica. The first outcome was an ecological assessment of finfish and benthic invertebrates, which was followed by a water quality assessment. Several graduate students from CMS and the UCR conducted research associated with this project for their masters' degree. The Sea Grant director of the University of Delaware, Dr. Thoroughood, indicated that the formal and informal educational exchange that occurred between the two universities was one of the principal benefits of the program.

6. ***VIMS and USC Partnership with the Israel National Oceanographic Institute.*** The Virginia Institute of Marine Science and the University of South Carolina conducted a two year project with the Israel National Oceanographic Institute (INOI). The objective was to strengthen marine research capabilities of both partners. The project was funded with a $148,000 SGIP grant and in-kind contributions totaling approximately $100,000 from INOI. Other supporting institutions from Israel included the Israel Port Authority, Ben Gurion University, and the Coastal and Marine Engineering Institute of Technion University. This project was also linked to an Israel and Egypt USAID program involving the Scripps Office of Naval Research.

7. ***New York Sea Grant Institute Partnership with the University of Concepción, Chile.*** The New York Sea Grant Institute was involved in a three year, $72,000 project with the University of Concepción (UC) to strengthen its marine science program. A formal Memorandum of Understanding was signed by the presidents of both universities. The project supported graduate students in marine sciences, research on the Bay of Concepción, and short courses in marine instrumentation.

8. ***University of Florida Partnership with the Indian Institute of Technology, Bombay.*** The University of Florida partnered with the Indian Institute of Technology in Bombay (now Mumbai) to produce a course for middle-level engineers concerned with implementing their country's master plan for improving small and intermediate-sized ports. This one-year project had a SGIP budget of $19,300 and counterpart financial contributions to conduct the course. The course brought together harbor engineers, consulting firms, universities and government ministries and facilitated an exchange of technical information. It had the side effect of increasing the government's support for postgraduate courses for public employees. The partnership between the University of Florida and the Indian Institute of Technology also catalyzed the establishment of links between other universities, including the University of California, Berkeley; University of Trondheim, Norway; Norwegian Institute of Technology; and, School of Engineering at the Aristotelian University of Thessaloniki, Greece.

9. ***Lehigh University Partnership with the Indian Institute of Technology, Kanpur.*** Lehigh University worked with the Indian Institute of Technology in Kanpur to educate graduate level students in geotechnical ocean engineering. The two year project had a SGIP budget of $175,000 and was intended to support graduate level research and education, establish a marine geotechnical data bank in India, develop specialized ocean engineering short courses and provide Indian faculty and

students with the opportunity to study in the United States. The project was discontinued in its early stages when the project's principal investigator left Lehigh University.

10. ***Oregon State University Partnership with Universities in Chile and Mexico.*** Oregon State University (OSU) worked closely with the Catholic University of Valparaiso and several other Chilean and Mexican universities during the course of a four year project that began in 1978. SGIP provided $492,500 and Chilean partners provided an equivalent contribution, demonstrating commitment and an equal partnership relationship. The objective of the project was to build competence in marine resource conservation and development, and to increase international exchange of marine information and data. This project was built from the experience of a decade of OSU cooperative marine programs in Latin America. The project organized two major conferences on marine science and technology, developed mechanisms for sharing of data and scientific results between U.S. and international researchers, provided opportunities for marine extension in Chile, supported graduate studies, and developed curriculum in marine resource management and ocean engineering.

11. ***University of California Partnership with Universities in Mexico.*** The University of California (UC) was involved in a project with Mexican institutions and universities with the goal of improving research and education capabilities in the marine sciences in Mexico. Partners in the $240,000 project included: Instituto Nacional de Pesca; Escuela Superior de Ciencias Marinas in Ensenada; Universidad Autónoma de Baja California; Centro de Investigaciones y de Educación Superior de Ensenada; and, Centro de Investigaciones Biológiacas, La Paz. The project built upon pre-existing working relationships among marine scientists at UC, San Diego State University, the National Marine Fisheries Service Southwest Fisheries Center and a number of Mexican institutions.

    The project supported 16 cruises on U.S. and Mexican research vessels, establishment of a joint mussel-watch program, sharing of data and technical fishery methods, completion of over 120 short courses, and development of marine libraries. The program was able to leverage $819,000 in research funding and $250,000 in development assistance funding. Program evaluation found that the success of the project was based on its truly cooperative nature.

12. ***URI Sea Grant Partnership with Universities in Malaysia.*** Faculty at the University of Rhode Island and several universities in Malaysia—Universiti Malaya, Universiti Pertanian Malaysia, and Universiti Sains Malaysia—collaborated in a four-year project designed to strengthen Malaysian capabilities to address and solve marine resource problems. The SGIP provided $379,000 and Malaysian contributions were estimated at over $100,000, including the support of the National Fisheries Development Company of Malaysia for selected research projects. The project focused on three areas: 1) economics of artisanal fisheries, 2) population dynamics and management of marine fisheries and, 3) coastal ecosystem studies in relation to fish production. URI faculty were involved in programs at Malaysian partner universities and helped develop research, education and marine advisory services. Several faculty members from Malaysia earned higher degrees at URI during the course of the project.

Sea Grant International Collaboration (1984-Present)

This section provides a summary of international collaboration and research following the end of funding of SGIP.

1. ***Latin America and Caribbean Sea Grant Initiative.*** The NOAA National Sea Grant Office, NOAA/OAR International Activities Office, the University of Rhode Island Coastal Resources

Center and the University of Rhode Island Sea Grant program began working together in 2003 to develop options for establishing a network of Sea Grant programs in Latin America and the Caribbean. This work is made possible by grants totally $180,000 provided by the U.S. State Department (Ocean, Environment and Science Initiative) and the NOAA National Sea Grant Office. The initiative is a response to requests for assistance from government and university officials in Honduras, El Salvador, Nicaragua and Ecuador to build Sea Grant programs in these countries. Activities include in-country consultations, national workshops, background papers, expert meetings, and development of a strategy for a LAC Sea Grant program. National workshops in Ecuador and Central America will be held in October 2003. The background papers and strategy paper are planned for completion in early 2004.

2. ***Sea Grant Disaster Relief Projects in Honduras and Nicaragua.*** In October 1998, Hurricane Mitch stalled and dumped a year's rain on Central America in forty-eight hours. It was the largest hurricane to hit Central America in two hundred years. Flash floods and mudslides wreaked devastation on a vast scale. Honduras, the second-poorest nation in the Western Hemisphere, was the hardest hit. In a population of 6 million, almost 6,000 people were killed and 1 million made homeless. Seventy percent of the country's productive infrastructure was damaged or destroyed. The government's initial estimate of the cost of reconstruction was $5 billion.

   The U.S. Government assisted with disaster aid, the majority of which was distributed through the United States Agency for International Development (USAID). Sea Grant approaches and partnerships were part of the package of U.S. disaster assistance to Honduras and Nicaragua. NOAA, USAID, the United States Geological Survey, the United Stated Department of Agriculture, and other agencies collaborated in the development of reconstruction and disaster mitigation projects that involved Sea Grant College programs at the University of Michigan, University of Florida and the University of Puerto Rico.

   Both Nicaragua and Honduras realized major destruction of the shrimp aquaculture industry following the hurricane. Farmed shrimp is one of the top sources of export earnings, employment and income in both countries. Central American cultured shrimp exports totaled $148 million in 1998. The shrimp farming industry in Honduras and Nicaragua suffered damages from the hurricane estimated at $81.6 million. USAID and USDA funded projects through U.S. Sea Grant programs to assist small-scale shrimp aquaculture farmers in areas of aquaculture technology, development, and extension.

   The first of these projects was a marine extension project in the Gulf of Fonseca region of Honduras and Nicaragua focused on shrimp farming under the leadership of the University of Puerto Rico Sea Grant Program (UPRSGCP). The goal was to develop an information and technology transfer program to educate and change the attitudes, perceptions and practices of resource users, resource managers and the general public with relation to the sustainable use of coastal and marine resources. The University of Central America (UCA) in Nicaragua and Zamorano University in Honduras were implementing project partners. A project Director and three marine extension agents were hired from each University. This program was funded from 2001 to 2002 with a budget of approximately $890,000.

   The second activity implemented in cooperation with the National Sea Grant Office was the Nicaragua Small Shrimp Producer Assistance Program lead by the Michigan and Florida Sea Grant programs. The goal was to modernize Nicaraguan shrimp farm technologies to enhance production efficiency, economic viability, and reduce the spread of viruses. The program was composed of three interrelated components: 1) construction of a demonstration, closed intensive shrimp production

system, 2) improvement in aquaculture financial systems, and 3) enhancement of aquaculture competence within small and medium sized operations.

The first component provided a demonstration of the feasibility of a closed intensive shrimp production system. One of the benefits of a closed system is reduced risk of the introduction of virus. The second component was targeted at increased availability of commercial financial credit and development agency resources for investments in closed shrimp production systems. The final component provided education and training to the aquaculture industry.

Two Universities involved with the hurricane disaster projects—University of Central American in Nicaragua and the University of Zamorano in Honduras—expressed to NOAA following completion of these projects that they were interested in continued assistance to help develop locally managed programs based on the Sea Grant model.

3. ***University of Connecticut Sea Grant Program Partnership with Mexico.*** The University of Connecticut Sea Grant program hosted a delegation of ministers and government officials from Baja California, Mexico in February of 2003 for the purpose of discussing the establishment of a Sea Grant type program located at the Universidad Autónoma de Baja California, Mexico. The government of Mexico expressed interest in the Sea Grant Program as a non-regulatory authority and honest-broker of information.

4. ***East and Southeast Asia Regional Network (CCOP).*** Discussions regarding development of a regional Sea Grant network in Southeast and East Asia began in the spring of 2002 when the Directors of NSGO and NOAA/OAR International Activities Office met with the Coordinating Committee for Coastal and Offshore Geosciences Programmes in East and Southeast Asia (CCOP). CCOP is an intergovernmental organization consisting of 11 member countries with a focus on regional geoscientific issues. Following the meeting, NOAA and CCOP have continued to share information about the Sea Grant program and the benefits that a network modeled after Sea Grant could provide to address coastal and marine resources issues in the East and Southeast Asia region.

5. ***University of Connecticut Partnership with Chile.*** A workshop held in Chile in December 2000 had the objective of developing a foreign academic exchange program between the University of Connecticut Sea Grant program, the National Undersea Research Program and several Chilean universities. At this workshop, the University of Connecticut Office of International Affairs established a formal M.O.U. with the University of Los Lagos, Chile, to participate in a collaborative exchange program. This collaboration is intended to build on aquaculture technical expertise in Chile and Sea Grant program expertise in extension. The collaboration originated from work on a joint bioremediation project between faculty from the University of Connecticut and the University of Los Lagos.

6. ***University of Hawaii Sea Grant Program in the Pacific Islands.*** Beginning in 1987, the Office of Territorial and International Affairs (OTIA), U.S. Department of Interior, responded to Pacific island requests for help with applied aquaculture programs and established a Sea Grant Pacific Aquaculture Program (PAP). This program was designed to provide assistance to governments and aquaculture entrepreneurs throughout the U.S.-affiliated insular Pacific. The name was changed after 1995 to the Pacific Regional Aquaculture Extension Service (PRAES). It continued with a high level of achievement through 1998.

In July 1987 a Congressional workshop examined ways that information and expert help could be extended to meet the broader challenges of appropriately using and protecting marine resources. The Director of the University of Hawaii Sea Grant Program presided over the workshop that was

attended by other Sea Grant directors, Congressional staff and government agencies. Testimony concerning this workshop was later presented before the House of Representatives, Insular Affairs Committee.

In September 1987, NOAA sent a fact-finding team to the U.S.-affiliated islands in the Western Pacific and identified strategies to help manage the marine resources of the islands. This team flagged extension services as the highest priority and the area to which U.S. agencies could most effectively respond. As a result, a proposal was presented to the Chief of NOAA's International Programs for "Creation of a NOAA Network for the U.S.-affiliated Islands." This proposal was circulated among government and Congressional offices and committees. A number of changes were made, but the essential concept of a network of specialist extension agents was adopted.

A 15-member interagency Pacific Island Network (PIN) Coordinating Committee was established. The Committee was composed of 13 U.S government agency and two UHSGCP representatives. The first meeting of this committee was held in September 1988 at the East-West Center, Honolulu, Hawaii. Each U.S.-affiliated island nation was invited to send a representative to provide input. As a result of this meeting, it was agreed that a nine-member Coordinating Committee would be responsible for overall policy guidance of the PIN with the Secretariat of the program located at the UHSGCP in Honolulu. The Secretariat was made up of five NOAA agencies, OTIA, the Army Corps of Engineers, and the Environmental Protection Agency. The program was initiated with a NOAA grant of $50,000 for extension agent support and $10,000 from OTIA to support activities. UHSGCP contributed experience and administrative support to initiate the program. By 1995 the combined budget for the PIN and PAP Pacific programs approached one million dollars.

The Pacific Island Network and aquaculture program provided island states with access to UHSGCP for educational resources and technical assistance. The strategy was to have a regional extension coordinator and an extension agent from UHSGCP in each Pacific state. By the mid-90's the network of extension agents and specialists functioning in Micronesia and American Samoa was almost complete. Funding was primarily directed at applied research and extension. Only limited funding was provided for university training and basic research. Extension agents formed local advisory committees and worked with local people to define program agendas. At its peak, there were about 25 extension agents. Most were funded with resources leveraged from other sources; only about a quarter were funded full time through UHSGCP.

The Pacific programs were showing outstanding results when without prior notification, a new OTIA administrator decided to discontinue funding for the PIN and PAP programs in 1995. People involved in the PIN and PAP programs have concluded that one of the enduring lessons is the value of building networks and making connections.

7. ***Partnership of Northeast Region Sea Grant Programs with Ireland.*** In 1986 a Memorandum of Understanding for a collaborative aquaculture exchange program was signed between University College, Galway, Queen's University in Northern Ireland and Sea Grant programs in the Northeast region. The Director of the Connecticut Sea Grant College program was chosen as the U.S. liaison and coordinated a variety of cooperative relations between 1987 and 1998, funding student exchanges, technology transfer, and workshops. Funding for some of the activities was provided by a grant from the International Fund for Ireland in the Department of Foreign Affairs, Dublin. Today, the M.O.U. is still in place and informal one-on-one interactions continue between the three institutions.

8. ***Wood Hole Oceanographic Institute Program for International Cooperation.*** The Woods Hole Oceanographic Institute operated an International Marine Science Cooperation Program from the 1980's to the early 1990's. This Program had the broad objectives of:

    - Improving opportunities for collaborative research between U.S. and foreign scientists
    - Increasing foreign country access to U.S. marine science expertise and education
    - Increasing opportunities for U.S. scientists to work in foreign waters
    - Strengthening a global approach to ocean studies

    Some of the projects that the program undertook include: production of a database of funding sources for international marine science; comprehensive review of international marine science projects at Sea Grant institutions; a cooperative marine science program with Portugal; construction of a database of maritime boundaries of 145 coastal countries; and establishment of the International Red Tide Information and Assistance Service.

Sea Grant Programs in Other Countries

Recent programs in South Korea and Indonesia are examples of how foreign governments and universities are introducing the Sea Grant approach of coastal and marine research, extension and education.

1. ***Korea Sea Grant Program.*** In order to manage and conserve its marine and coastal resources more effectively, the government of South Korea adopted in 1999 a Marine Development Basic Plan, also called Oceans Korea 21. The Korea Sea Grant Program (KSGP) was established under this Plan in June 2000. The Program is administered by the Marine Policy Bureau of the Ministry of Maritime Affairs and Fisheries (MOMAF).

    The KSGP established a Review Panel, comprised of the MOMAF Vice-Minister and several other Director-Generals from the Ministry, to be responsible for the creation of a master plan, designation of Sea Grant colleges, review of support programs, and the development of funding requests for KSGP's operations. The KSGP finished its first phase of program implementation in 2000-2001, which provided grants for university-level research and development projects. To date, the Korea Sea Grant Program has funded 60 research projects. The operating budget was $1,100,000 in 2003. The second stage of program implementation will occur over the next several years and will focus on designating Sea Grant colleges and implementation of extension programs.

    The NOAA/OAR International Activities Office has provided assistance in program development to the KSGP. NOAA/OAR and the National Sea Grant Office are also working together to establish a joint project with the KSGP on offshore aquaculture technology. This cooperative project would benefit scientists, technicians and the aquaculture industry in both Korea and the United States.

2. ***Indonesia Sea Partnership Program.*** The Indonesia Ministry of Marine Affairs and Fisheries (MMAF) has established a "National Sea Partnership Program" (*Program Kemitraan Bahari)* modeled after the U.S. Sea Grant Program. The Program is lead by Dr. Widi Pratikto, Director General for Coast and Small Island Affairs. Dr. Pratikto completed his Ph.D. in Coastal Engineering at the University of North Carolina with part of his research funded by the North Carolina Sea Grant Program. As a result, Dr. Pratiko is knowledgeable about the U.S. Sea Grant program.

    A National Coastal and Small Islands Management Act has been submitted to the Indonesia National Parliament. This Act would provide a legislative base for the Sea Partnership Program and specify

national funding sources. In addition to national funding, resources for the Program will come from regional budgets approved by regional Parliaments. The Indonesia National Parliament approved a budget of US$325,000 for FY-2003 to organize and initiate activities within the Sea Partnership Program. Some regional government agencies have also allocated funds or in-kind support for FY-2003 activities.

Five regional universities have been initially selected in the Indonesia Sea Partnership Program. Each has formed consortia that include other universities in their respective region, representatives from local government and the private sector. These consortia will establish charters that specify the principles of operation including, how program priorities will be established, how projects will be evaluated, how funds will be distributed, and how funded projects will be monitored.

The regional consortium and the National Sea Partnership Program office are designed as a network to facilitate information transfer, cross-training, and shared research. The Directorate for Coast and Small Island Affairs will develop national priorities to guide planning for research and extension. However, each consortium will operate as a semi-autonomous, regionally focused center and will also establish their own specific priorities and secure local funding to address them. The Sea Partnership Program helps develop capacity for decentralized governance by strengthening coastal resource planning and management at the regional and local level.

USAID and the Indonesian Ministry of Marine Affairs and Fisheries co-sponsored a study tour in November 2002 that included visits to Sea Grant programs at the University of Hawaii, North Carolina State and the University of Rhode Island. The NOAA/OAR Office of International Activities and the NOAA National Sea Grant Office are working with the Director General for Coast and Small Island Affairs to develop mechanisms for collaboration with U.S. Sea Grant programs, such as student exchanges, technical cooperation, and developmental assistance.

5. RELATED EXPERIENCE IN COASTAL AND MARINE RESEARCH, EDUCATION AND EXTENSION

There are no other structures in the coastal and marine sector that we are aware of with precisely the same collection of attributes as Sea Grant—university based network, competitive grants, systematic links of science and extension, local-national priority setting, and long-term continuity. There are, however, many bilateral and multilateral projects and programs in fisheries, mariculture, coral reef conservation, integrated coastal management, coastal tourism, and many other coastal and marine themes that share some similarities with the goals and attributes of Sea Grant.

This paper can not review the full breadth of international experience in coastal and marine management, education, research, and technology development. However, it is useful to highlight some of the important projects and programs for purposes of expanding ideas on alternative mechanisms as well as potential partners in the establishment of a network of Sea Grant type programs in Latin America and the Caribbean.

Bilateral Projects and Programs

USDA International Partnerships in Mariculture Development. The coordinating role and systematic linkages of university science and field extension are key attributes of the Sea Grant College Program. Two recent USDA initiatives in Central America and the Pacific are good examples of the value of networks and the combination of university-based science and extension on mariculture development themes.

One initiative was part of the U.S. government, hurricane disaster relief efforts in Honduras and Nicaragua. The project: "Training and Curriculum Development for Small/Medium Shrimp Producers with Emphasis on Best Management Practices to Guide Post-Hurricane Mitch Recovery" was implemented with University and private sector partners in Nicaragua and Honduras. The project was a collaboration between universities in the U.S., Honduras and Nicaragua, and shrimp farm associations.

There were four areas of emphasis: 1) training in technologies that improve production, lower costs and reduce health and safety risks; 2) training in practices that maintain environmental quality on the farm and in the associated ecosystem; 3) strengthening extension capabilities of local technical experts and educators to enhance technology transfer and adoption of new practices; and 4) direct capacity building for shrimp farmers to enable them to adopt and implement improved practices.

Training materials were prepared on good practices for small and medium scale shrimp aquaculture and were the basis for a series of "training-of-trainer" courses throughout the region. The materials are designed for use by extension staff to train small and medium shrimp farmers (Haws and Boyd, 2001).

A second initiative builds on the earlier work of the Sea Grant Pacific Aquaculture Program (PAP). The 3-year project (2001-2004) "Bridging Gaps to Insure Long-term viability of Small Tropical Mariculture Ventures in Hawai'i and the U.S.-affiliated Islands" is supported by a $500 thousand grant from the USDA International Agriculture and Food Systems Program. The project involves coordination, planning and action items in 6 areas: demonstration and training; education; development of best management practices; hatchery development; policy development; and, economics, marketing and business development. Primary U.S. partners are the University of Hawaii, University of Rhode Island, and the Fisheries Technology Center, Kodiak Alaska. Principal university-based partners in the Pacific islands are the Pohnpei Agricultural Trade School, College of Micronesia and College of the Marshall Islands. Like earlier Pacific efforts of Sea Grant, one of the principal contributions of the project is enhanced coordination, planning, information exchange and networks.

Sida/SAREC Regional Marine Science for Management Program. The Regional Marine Science Program of the Swedish international development agency (Sida) is a good example of a regional Sea Grant type program involving a network of developing country partners and countries. SAREC is the agency in Sida that is responsible for education and research programs with universities. Beginning in 1993, it established a regional marine science program in East Africa. In the first years of the program much of the funding supported thesis research and graduate education. At the same time, Sida/SAREC has for almost two decades supported graduate education and research in the marine sciences through bilateral agreements with Universities in Tanzania and Mozambique.

As a result of the bilateral programs in Tanzania and Mozambique and the Regional Marine Science Program, there is now a strong critical mass of M.Sc. and Ph.D.graduates in the marine sciences. The programs are "sandwich" programs in which students study both at their home university and at Swedish or other partner universities, and conduct their thesis research in their home country. In this way, there are two way benefits between North-South faculty and institutions.

One of the program's most notable achievements during its first phase was the transformation of the Tanzania Institute of Marine Sciences (IMS) of the University of Dar es Salaam into an internationally

recognized institution with a permanent staff of 17 researchers of which 10 have Ph.D.s. IMS attracts funds from a diversity of sources, hosts visiting scholars from many nations and contributes to coastal and marine resource management in Zanzibar, Tanzania and the entire Western Indian Ocean region.

Following a 1999 evaluation of the Regional Science Program at the end of its first phase, the program was redesigned specifically along the Sea Grant model of competitive grants in priority theme areas (Olsen, Tobey, and Brinck, 1999). The Western Indian Ocean Marine Science Association (WIOMSA) coordinates the new program known as MASMA (Marine Science, for Management). The Coastal Management Research Center (COMREC), located at the College of South Stockholm is the coordinating partner for the program in Sweden. In addition to the competitive grants program, there are three other related and mutually reinforcing operational program components of MASMA:

1. Institutional strengthening of WIOMSA to administer and coordinate research activities, training and outreach in the region
2. Regional networking, research priority setting and professional development through short-term courses, seminars, and workshops
3. Communication of research results and information dissemination

The total budget for the first three years of MASMA was $2.8 million. Of this total, approximately 49, 29, 15, and 7 percent went toward research, institutional strengthening, training and workshops, and communications, respectively (Tobey and Torell, 2003).

Each MASMA research project is funded for three years at a maximum of $50 thousand per year. A MASMA Program Committee of six members meets biannually to discuss and select proposals, and manage the research grants program. The research program is presently guided by five thematic areas of research: 1) sustainable fisheries and food security; 2) ecosystem research; 3) pollution “hotspots”; 4) sustainable tourism; and 5) monitoring, databases and predictive sciences.

USAID Integrated Coastal Management Cooperative Agreement. USAID has funded many coastal management projects around the world. Most coastal and marine activities in tropical developing nations are funded through USAID country offices. One of the longest-standing integrated coastal management projects funded through a country office is the Philippines coastal management project.

Since the early 1980’s USAID has also supported a cooperative agreement with the Coastal Resources Center of the University of Rhode Island on integrated coastal management. This agreement is coming to an end in September 2003. The initiative has supported planning, policy making, and resource conservation in many tropical developing countries, including Ecuador, Central America, and Mexico in the LAC area. University partnerships in research and extension were an important element of the strategies for advancing work on coastal management in all the countries where there were major programs. Key university partners have included, for example, ESPOL University in Guayaquil, Ecuador; University of Quintana Roo, Mexico; University of Dar es Salaam, Tanzania; and the Center for Coastal and Marine Resources Studies at Bogor Agricultural Institute, Indonesia.

International Programs

WorldFish Center. The WorldFish Center was created in December 2003. It was previously known as the International Center for Living Aquatic Resources Management (ICLARM). WorldFish Center is an international scientific and technical center whose mission is to stimulate and conduct research on all aspects of fisheries and other living aquatic resources. It was formed in 1975 as a program of the University of Hawaii, and was later incorporated in Manila, Philippines, in 1977. It became a member of the Consultative Group on International Agricultural Research (CGIAR) in 1992.

The goal of the WorldFish Center is to contribute to food security and poverty eradication in developing countries through research, partnership, capacity building, and policy support on living aquatic resources. The Center focuses on sustainable aquatic resource management in tropical developing countries (in both inland aquatic and marine systems). Research is carried out on their dynamics, on investigating alternative management schemes, and on improving the productivity of key species. The work includes cooperative research with institutions in developing countries, and supporting activities in information and training.

There are 16 CGIAR regional centers around the world with total funding of $331 million in 2000. Support for CGIAR comes from contributing Members, of which there are about 55. Funding for WorldFish was $2.5 million in 2000. The programs of WorldFish Center are supported by private foundations, governments and international organizations. The World Bank is the largest contributor to the WorldFish Center and the other CGIAR research programs. The Bank contributed over $50 million, or about 15% of the CGIAR budget in 2000. The United States is the strongest individual country supporter of the CGIAR network. Primary responsibility for CGIAR is vested with USAID. The U.S. Department of Agriculture and nearly 100 U.S. universities have a rich history of scientific and technical cooperation with the CGIAR centers. Other major contributing Members are Japan, European Commission, Canada and individual European countries. CGIAR has a well-developed governance structure that includes an Executive Council, Science Council, and four Committees. Each Center has a Director-General and Secretariat.

Multilateral Development Banks. The World Bank, Inter-American Development Bank, Asia Development Bank, and others have expanded their environmental programs in the wake of the 1992 UNCED summit and are increasingly involve in marine and coastal issues. The World Bank, for example, has spearheaded ICM projects in the Mediterranean Sea, the Baltic Sea, the Red Sea, the Aral Sea and the Caspian Sea. ICM is part of the Bank's portfolio of coastal investment projects in many countries, such as Indonesia and Mexico. In 1998 the Inter-American Development Bank approved a strategy for coastal and marine resources management in Latin America and the Caribbean. Ecuador is an important partner in IDB's ICM strategy. Ecuador obtained a $10 million loan from the IDB in the early 1990's to continue its National Coastal Management Program, initially launched through grants provided by USAID. A second loan of about $10 is now in the final stages of negotiation. Research, education and extension with ESPOL University and other coastal universities and technical institutes have been an important element of the USAID and IDB projects.

The World Bank and UNDP are implementing agencies for projects funded through the Global Environment Facility (GEF). The GEF has provided significant funding for projects and studies in ocean and coastal management, including multi-million dollar coastal management projects in Patagonia, Argentina, Belize, Dominican Republic, and Cuba.

UN Organizations. Many UN organizations support initiatives in marine and coastal science, information sharing, training, and education.

The Intergovernmental Oceanographic Commission (IOC) is a UNESCO organization that supports many scientific research programs in ocean sciences and technology. Its Programme on Coastal Ocean, Advanced Science and Technology (COASTS), for example, provides an international framework within

which national and regional programs and projects may be coordinated to contribute to a global understanding of coastal processes. Its TEMA (Training, Education, and Mutual Assistance in Marine Sciences) program supports national and regional workshops and marine science education.

The Food and Agriculture Organization of the United Nations (FAO) supports work on fishery research and policy, including integrated aquaculture development, has prepared training and educational materials, and sponsors regional and international workshops on fisheries and coastal management.

The United Nations Environment Program (UNEP) supports many initiatives in marine and coastal management. UNEP is the sponsor of the Regional Seas Program, initiated in 1974. Regional Seas is a global program implemented through regional components. There are now thirteen regions involving more than 140 coastal States and Territories. Ecuador is part of the South East Pacific regional program. Honduras, Nicaragua and El Salvador are part of both the South East Pacific and the Caribbean regional programs. Regional Action Plans are the substantive basis for program strategies and actions. Action Plans are targeted at both the mitigation of the consequences of environmental degradation, and the causes of environmental degradation. They are the program's comprehensive strategies to combating environmental problems through the rational management of marine and coastal areas. The Regional coordinating Unit of the Plan of Action of the South East Pacific is located in Quito, Ecuador.

UNEP's Regional Office for Asia and the Pacific hosts a program called the Network for Environmental Training at the Tertiary Level in Asia and the Pacific (NETTLAP). This program develops methods in environmental training, identifies regional training needs and shares knowledge through ongoing interaction among network partners. Partners consist of institutions and individuals active in environmental education and training at a tertiary level (e.g. university, technical institute, teacher training college) in the region.

The United Nations Development Program (UNDP) has a significant program in capacity building for sustainable development, called Capacity 21; it was launched to build national capacities for the implementation of Agenda 21. Integrated coastal management is one of the areas of focus. Working with governments, civil society and the private sector, Capacity 21 programs support the development of integrated, participatory and decentralized strategies for sustainable development. Capacity 21 programs are country-owned, country-driven processes with the goal of influencing national and local decision-making to build long-term capacities at all levels of society. Since 1993, Capacity 21 has worked with over 75 developing countries, including Ecuador, Honduras, Nicaragua, and El Salvador.

UNDP also provides funding for the Train-Sea-Coast program, launched in 1993, also in response to the recommendations of Agenda 21. Train-Sea-Coast is a decentralized global program for coordinated development and sharing of standardized course materials in ocean and coastal management. Ten academic institutions located in nine countries in all major geographical areas of the world (Brazil and Costa Rice in LAC area) are currently members of Train-Sea-Coast. Each institution develops a set of courses in ocean and coastal management using a detailed common methodology.

The EU-Latin America ALFA Program. The ALFA Program (Latin America Academic Education Program), approved by the European Commission in 1994, is a major program of scientific collaboration between the European Union and Latin America. This program is implemented by networks of universities, which present proposals of joint cooperation.

A proposal for an ALFA project must involve a network of at least six universities (three from Latin America and three from EU). Each network is coordinated by one of the institutions. In the first 5 years (1994-1999), a total of 846 projects were approved with a budget of 38.4 million Euros. The second phase (2000-2005) has a budget of 42 million Euros. Seventeen countries from Latin America have been

involved, including Ecuador, Honduras, and Nicaragua and El Salvador. The ALFA Program supports scientific and technical training in many disciplines. Recently, a project on a "Master Program on Tropical Integrated Areas" has been approved, with the University of Costa Rica as the coordinating institution. A related program is the "Doctoral Program on Environmental Sciences" of the University of Concepcion (Chile), which includes modules on Integrated Coastal Zone Management and Marine Pollution.

6. CONCLUSIONS

The experience with SGIP and more recent international partnerships demonstrates that the Sea Grant approach of university-based research, education, and extension is not only transferable to developing nations, but is enormously needed.

The cooperative educational and scientific exchange was viewed as one of the most valuable benefits of international partnerships between U.S. Sea Grant programs and institutions in developing nations. In some initiatives, such as the Pacific programs of the 90's, the connections and networks of Sea Grant were viewed as critical. The value of networks and coordination can be easily understood in a region of incredibly isolated, marine rich island states with little access to institutions of higher education.

Critical to the success of international partnerships was joint funding. All international partnerships of SGIP and international projects that came after SGIP have benefited from significant support by local institutions. In some cases, local resource commitments and locally leveraged support even exceeded U.S. Sea Grant partner contributions. This illustrates the key principals of local commitment and ownership, and equality of North-South partners.

The experience in the Western Indian Ocean Region with the MASMA program demonstrates that a competitive, peer review grants process can succeed even in developing nations with very little previous experience with such procedures. It also shows that it is possible to identify priority research themes in a large geographic region through a coordinating body, such as WIOMSA.

In both Indonesia and Korea, where national Sea Grant institutions are being created, several common features emerge as critical to success: strong political will at both national and regional levels, significant commitment of national funds, local ownership and planning, enabling national policy or legislation, and technical assistance from NOAA and USAID.

As the Indonesia Sea Partnership Program shows, Sea Grant is also consistent with the global need to build capacity for decentralized governance and public administration. The bottom-up and top-down combination strengthens decentralized planning and coordination of marine and coastal affairs.

The challenges to transferring Sea Grant to developing countries are also opportunities for new Sea Grant programs. For example, the authors of this paper recently spent 5 days meeting with institutions in Quito and Guayaquil, Ecuador to discuss marine and coastal affairs and the potential role of a Sea Grant type program. A consistent finding was the lack of mechanisms for adequate coordination of national and international initiatives on coastal and marine science, education, and extension. Another very clear gap is the absence of extension. Tarifeño-Silva (2002) concludes that these challenges also apply to all of Latin America and the Caribbean.

Tarifeño-Silva (2002) adds another challenge, which can also be seen as an opportunity for a Sea Grant program— inadequate professional communication between the various disciplines (oceanographers, marine biologists, planners, and marine affairs). Coastal and marine science is interdisciplinary, but there

is a lack of experience for exchanging views on the same subjects from different professional perspectives. This situation often leads to finding solutions from a monodisciplinary approach.

Annex 1
Sea Grant College Programs

Great Lakes Region

1. Illinois-Indiana Sea Grant College Program
2. Michigan Sea Grant College Program
3. Minnesota Sea Grant College Program
4. New York Sea Grant Institute
5. Ohio Sea Grant College Program
6. Pennsylvania Sea Grant Project
7. Wisconsin Sea Grant Institute

Northeast Region

8. Connecticut Sea Grant Program
9. Maine Sea Grant College Program
10. Massachusetts Institute of Technology Sea Grant College Program
11. New Hampshire Sea Grant College Program
12. Woods Hole Oceanographic Institution Sea Grant Program
13. Rhode Island Sea Grant College Program

Mid-Atlantic Region

14. Delaware Sea Grant College Program
15. Maryland Sea Grant College Program
16. New Jersey Sea Grant Program
17. North Carolina Sea Grant College Program
18. Virginia Sea Grant College Program

Southeastern Atlantic and Gulf of Mexico Region

19. Florida Sea Grant College Program
20. Georgia Sea Grant College Program
21. Puerto Rico Sea Grant College Program
22. South Carolina Sea Grant Consortium
23. Louisiana Sea Grant College Program
24. Mississippi-Alabama Sea Grant Consortium
25. Texas Sea Grant College Program

Pacific Region

26. Alaska Sea Grant College Program
27. California Sea Grant College Program
28. Southern California Sea Grant College Program
29. Hawaii Sea Grant College Program
30. Oregon Sea Grant College Program
31. Washington Sea Grant College Program

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